A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE

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BY

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Dedicated

to

my family

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Teachers

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ABBREVIATIONS

CPA	Circumferential Purse-String Approximation
p- value	Probability Value
PC	Primary Linear Closure
SD	Standard Variation
SSI	Surgical Site Infection

ABSTRACT

Introduction: Surgical site infection (SSI) is one of the most common complications that can occur after stoma closure. It is associated with increased costs for healthcare services, hospital stays, medications and nursery care, as well as with increased morbidity and poor quality of life.

Aim: To assess the clinical outcome of wound healing after two separate techniques of stoma closure.

Technique 1 – primarylinear closure.

Technique 2 – purse string closure.

Material & Methods: This prospective study included all patients admitted to DMCH fulfilling the inclusion criteria for elective stoma closure from 1st March 2018 to 1 March 2019 and prospective study was conducted on wound healing after stoma closure to compare difference in SSI rate between the PC group and the CPA group and to discuss the differences in patient satisfaction with wound healing. The following study was carried out with 18 patients in purse-string group and 33 patients in linear closure group.

Results: SSI was observed only in primary linear closure group in 24% patients as opposed to 0% in purse string closure group. ($p=0.039$). The overall total satisfaction score was higher in the purse string group. The purse string closure group showed significantly higher satisfaction score for expectations regarding appearance of scar/cosmesis, level of postoperative pain and difficulty of wound care ($p>0.05$).

Conclusion: If CPA is performed as a skin closure technique after stoma reversal, the incidence of SSI was lower than it was when a PC was used and patient satisfaction for expectations regarding appearance of scar/cosmesis, level of postoperative pain and difficulty of wound care are greater in the CPA group than in the PC group. Thus we conclude that, CPA may be a good alternative option, but further prospective randomized trials involving more patients are necessary before a definitive conclusion can be drawn.

Keywords: wound healing, stoma closure, surgical site infection.

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INTRODUCTION

A stoma is commonly used in the management of bowel perforations, gut obstruction, gut gangrene, gut resection and anastomosis, colorectal cancer surgery, inflammatory bowel disease (ulcerative colitis), and low anterior resections of rectal cancer. Many complications can occur after stoma closure like surgical site infection (SSI), obstruction, necrosis, leakage, and iatrogenic incisional hernia.[1]

Morbidity after stoma closure, however, is not negligible. The main causes of morbidity are wound infection (0%–20%), intestinal obstruction (0%–13%), postincisional hernia (2%–12%), and anastomotic leakage (6%). Surgical site infection (SSI) is one of the most common complications that can occur after stoma closure. The incidence of wound infection ranges from 0% to as high as 41%, depending on investigators.[2,3]

Pokorny et al reported a mortality of 3%, wound infection of 20%, intestinal obstruction in 10%, and anastomotic leakage in 5%.[4]

Reports have described differences in the incidence of wound infection depending on the skin closure technique, but there is no consensus on the ideal closure technique for a stoma wound.

The development of a wound infection depends on the complex interplay of many factors. If the integrity and protective function of skin is altered, large quantities of different cell types will enter the wound and initiate an inflammatory response. This may be characterised by the classic signs of redness, pain, swelling, raised temperature and fever.

The potential for infection depends on a number of patient variables. Such as the state of hydrartion, nutrition, existing medical conditions as well as extrinsic factors, for example, related to pre, intra and post operative care, the skin closure technique, sterlity maintained during intra-op procedure and post op wound care management.

The common causes of wound infection are wound contamination due to bacteria on the skin in the vicinity of the ileostomy in contact with bowel contents for a long time and the leakage of the ileostomy contents. It is

associated with increased costs for healthcare services, hospital stays, medications, and nursery care, as well as with increased morbidity and poor quality of life.[2,5,6]

Due to severe wound infection, prolonged hospital stay, medications, or outpatient wound care may be required. In addition, more time may be required before a normal life can be resumed.

The treatment of surgical site infection requires wound drainage, cleaning, and antibiotics. However, the cosmetic results are not satisfactory and the healing time is extended. In addition, wound infections are associated with a higher incidence of incisional hernias. This leads to additional surgical procedures and increased costs.[7]

It has been estimated that each patient with a surgical site infection will require an additional 6.5 days in hospital, resulting in almost doubling of hospital costs associated with the patient.[8]

To date, there is no consensus on the ideal closure technique of the stoma wound to minimize postoperative SSI and multiple techniques have been proposed: tight primary closure, loose primary closure, delayed primary closure, or no closure and healing by secondary intention. Primary closure of the wound leads to rapid healing but has been associated with higher postoperative SSI.[8-10]

Therefore, to reduce wound infection, Banerjee[6] proposing a hybrid technique, reported that after an ileostomy reversal, if wounds are closed by purse-string skin closure, wound infection is less, and scars become smaller, making it cosmetically superior. The PS technique combines the concept of leaving the wound open to provide drainage and minimize SSI while still providing some degree of wound opposition to minimize healing time.

Until now, studies analyzing the effectiveness of purse-string skin closure are rarely conducted. In this study, in order to assess the efficacy of purse-string skin closure in an ileostomy reversal, we will perform wound

closure by using either conventional linear skin closure or purse-string skin closure, and rates of wound infection.

Hence this prospective study on wound healing after stoma closure was done at our tertiary care centre to assess the clinical outcome of wound healing after two separate techniques of stoma closure.

AIMS AND OBJECTIVES

To assess the clinical outcome of wound healing after two separate techniques of stoma closure.

Technique 1 – primary linear closure.

Technique 2 – purse string closure.

REVIEW OF LITERATURE

The formation of a stoma in abdominal surgery is now a simple routine procedure. Strangely, however, it was with difficulty that this simple step evolved over a long period of time. First, there was exteriorization of simple wounds of the abdomen when the bowel presented itself, but even this step was not formally recommended until the 18th century. Indeed, the earliest record of suturing the bowel with a successful outcome was by Saliceto in the 13th century.[11]

Death was the usual immediate result. Asepsis and anaesthesia were obviouslyn on-existent in these times and so a minimum of surgical steps were required for possible patient survival after operation. This left the way open for astoma to be created as the sole procedure. This step had minimal exposure of the abdomen and immediate relief for the patient. The 18th and 19th centuries moved from exteriorization of lacerations toileostomy or caecostomy and left inguinal colostomy for large bowel obstruction, in both adults and children. A number of reports appeared, and events gradually unfolded from emergency to elective operations. At this stage all sorts of ingenious types of stoma were devised. The third step of stoma evolution was to add a deliberate bowel resection. First performed as exteriorization resection, bowel resection was slow to develop. It was well into the19th century before resection with stoma formation developed. Strangely, it has been the second half of the 20th century when improvements in the actual surgical creation of the stoma have occurred. The final step in this evolution was the great advances instoma appliances.

HISTORICAL PRESPECTIVES

Von Hohenheim came from Einsieden and took the name Paracelsus (para = beside, Celsus = Hohenheim), possibly for anonymity, or possibly from self-conceit. He taught how to suture small bowel lacerations over silver cannulae. He was probably the first to suggest the deliberate creation of an artificial anus for penetrating injuries, in 1520.[12]

Heister probably the true first of the German surgeons, recommend exteriorization for transection of the bowel in 1757. Discussing the problem of transection or loss of substance of the bowel, he wrote. 'That the Lips of the Intestines so wounded, would sometimes quite unexpectedly adhere to the Wound in the Abdomen; and therefore, there seemed to be no Reason why we should not take this Hint from Nature."[13] As this caused considerable inconvenience to the patient, especially without suitable appliances, there was criticism of this technique. Heister replied, however, that, 'it is surely far better to part with one of the Conveniences of Life, than to part with Life itself.' Specifically discussing exteriorization rather than suture of a bowel laceration, Heister wrote 'they chose now to deal more tenderly with the Patient, and to substitute a gentler Method of Cure.' Good results regarding survival were obtained, especially if the stomach was involved.

However, exteriorization or suturing of the gut at this time was by no means accepted as Palfin (Palfyn), Master of the Barber Surgeons Company of Ghent in 1743, and John Bell in 1801, thought that it was far more important to sew up the wound in the abdominal wall, rather than close the intestinal laceration.[14]

In 1843, Gross quoted John Bell as saying, 'all the viscera of the abdomen may be wounded, yet no blood or faeces can escape.[15]

Palfin passed a suture through the mesentery (in animals), and pulled the opened bowel up against the abdominal wall with the loop. Blegny, surgeon to the Duke of Orleans, successfully created a loop jejunostomy in a dog in 1715, and Schacher in 1720, copied this method and had a clinical success. Then Peyronie from Montpellier, in 1733, passed the loop through the mesentery immediately adjacent to the bowel under the centre of the laceration and then sewed the margins of the laceration to the skin.[16]

In 1783, Benjamin Bell modified this method because he feared stenosis. He made a double-barrel opening with the sutures being cut short at the

knot. As some of these adventurous steps to create a stoma which was to lead to resection are reviewed, it is interesting to reflect on the contemporary surgical scene.

Nearly all intestinal suture methods of these times pulled the bowel wound up against the abdominal wall to obtain healing by adhesion against the peritoneum. This was done by leaving long suture ends through the bowel, pulling these ends tight and then attaching them firmly to the skin. The method was not a deliberate exteriorization, although it often became one.

Louis, secretary to the Royal Academy of Surgery in Pans and a professor of surgery, was the first recorded to advise the formation of a caecal fistula for intestinal obstruction in 1757.[17]

In 1840, Nelaton taught students to open the abdomen in the right iliac fossa in cases of intestinal obstruction, to seize the first loop of distended bowel, to suture it to the wound and then to open it. He felt that this would establish a caecal fistula.

Initially no clear distinction was made between jejunostomy, ileostomy, and colostomy, or indeed, between a faecal fistula and a surgically created stoma: all were regarded as an artificial anus. It was not until 1833, when Dupuytren described the characteristics of an artificial anus with its afferent loop, efferent loop, and a spur, that the distinction was made clear.

What was probably the first elective abdominal colostomy in an adult with survival was the operation in 1797 by Fine of Geneva.[18] He operated on a 63 year old woman with 2 weeks' constipation and huge abdominal distension. He made a lower midline incision, pulled the colon out and held it by means of a waxed thread passed through the mesentery. The colon was then incised and stitched to the parietal peritoneum with the patient living a further 3.5 months. Post-mortem showed that he had performed a transverse colostomy.

The first exteriorization resection was performed by Bryant of Guy's hospital, London; it took place possibly in 1832 but was published in

1882.[19] This operation, for a stricture of the descending colon, was carried out through a left loin incision and a double-barrel colostomy was constructed.

For the first end colostomy, Made lung advised that the bowel should be cut completely across, the distal end closed and returned to the abdomen. A single end colostomy was then constructed with the proximal end.[20] This technique is now known as the Hartmann procedure. Hartmann described a left inguinal loop colostomy held with gauze in 1900, and it was in 1903 that he discussed the method which now bears his name.

In summary, this evolution has been the exteriorization of traumatic wounds, such as by Heister, stoma formation which was either ileostomy or caecostomy such as by Louis, or left inguinal colostomy as by Maydl, and then stoma formation with bowel resection, as described by Hartmann. The evolution needs to be placed against the overall development of surgery which has depended upon the formation of a special group known as surgeons, and subsequently, antisepsis, anaesthesia and later blood transfusion and antibiotics.

TYPES OF STOMA

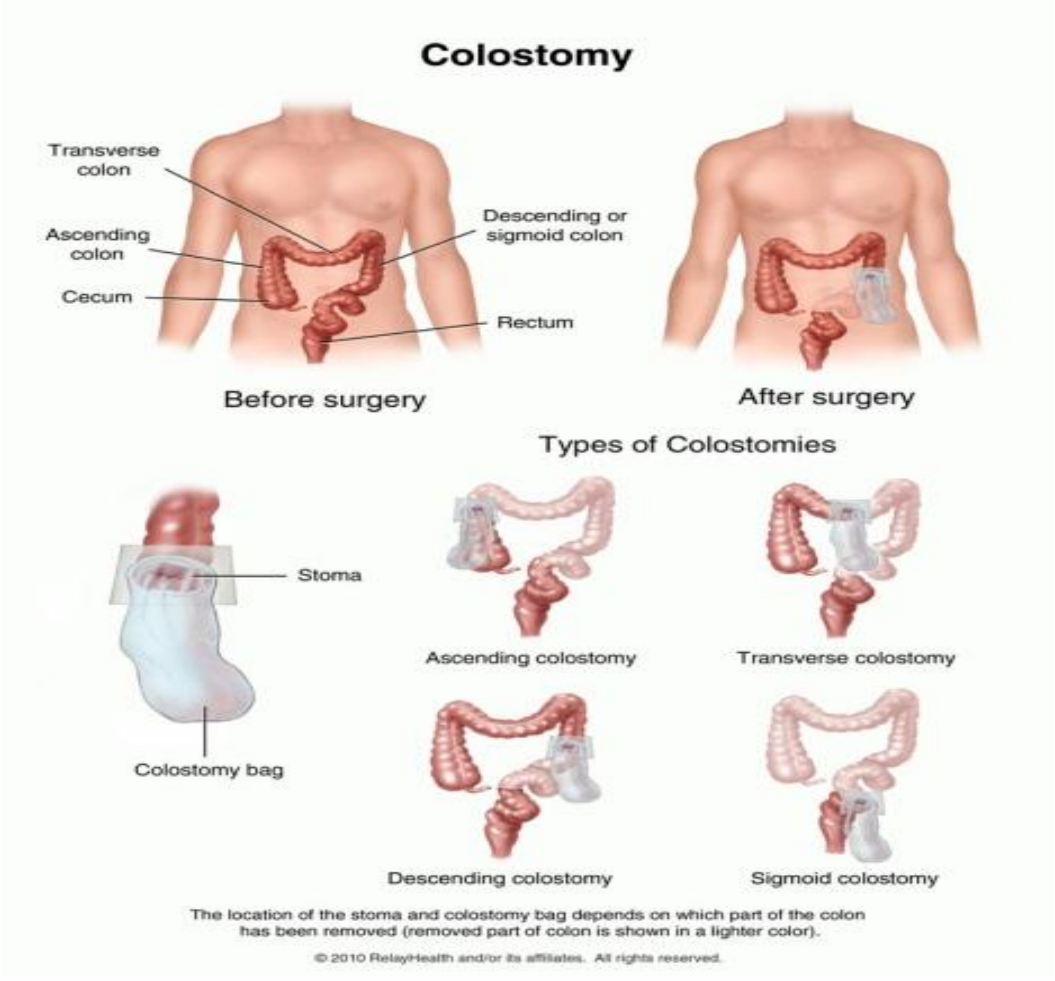
An ostomy is a surgical procedure performed when normal bowel or bladder function is lost due to birth defects, disease, treatment for disease, or injury. Conditions that may require an ostomy include perforation perotinitis, intestinal obstruction, colorectal cancer, traumatic injury to the bowel or bladder, diverticulitis, inflammatory bowel disease, and removal of the bladder. Ostomy procedures are performed in a hospital and patients are admitted for several days or longer, depending on the severity of the condition and complications that occur.

An ostomy may be temporary or permanent. Temporary ostomies are created when the digestive tract must be allowed to heal without irritation caused by the passage of waste. The surgery allows the body's wastes to be expelled through an opening created in the abdomen. Types of ostomy procedures include colostomy, ileostomy and urostomy. The type

performed depends on the location and extent of the disease or injury. A person who has had ostomy surgery is an ostomate.

Colostomy

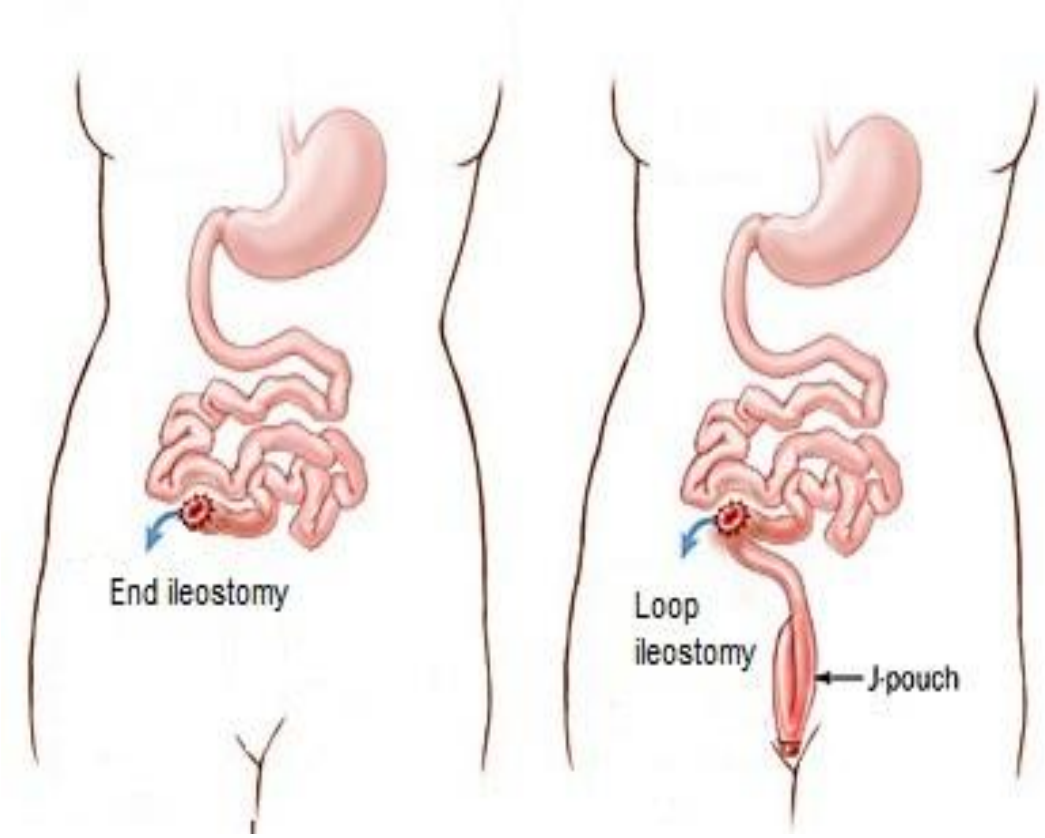
A colostomy involves creating an opening in the abdomen (ostomy) and pulling through a portion of the large intestine (colon). This is called a stoma and allows stool to pass directly out of the body, bypassing the diseased or damaged section of the colon. The consistency and frequency of the discharge from the stoma depends on the type of colostomy performed. There are four main types: ascending, transverse, descending, and sigmoid.



TYPES OF COLOSTOMY

Ileostomy

An ileostomy is performed under general anesthesia and involves surgically creating an opening in the abdomen (ostomy) and pulling through a portion of the small intestine (ileum) to create a stoma. In many cases, the colon is removed and its function (reabsorbing water and electrolytes) is partially carried out by the small intestine. Discharge after an ileostomy is liquid or pasty in consistency and occurs several times a day, usually after meals.



TYPES OF ILEOSTOMY

Urostomy

A urostomy, also called urinary diversion, is performed to divert urine from a diseased or damaged section of the urinary tract. It is usually performed after the removal of the bladder. In this procedure, which is performed under general or spinal anesthesia, an opening in the abdomen (ostomy) is created for the discharge of urine.

A temporary stoma is frequently used in the treatment of intestinal perforation, obstruction, colorectal cancer, inflammatory bowel disease and diverticulitis. In particular, it is used to reduce the anastomotic leakage and the reoperation rate. Various complications can occur after stoma closure. Wound infection, small bowel obstruction, anastomotic leakage and incisional hernia are examples of complications.

Among them, surgical site infection (SSI) is the most common complication, occurring in 2%-40% of cases after primary linear closure (PC).[2,21] Factors accounting for the high rate of infection after primary linear closure of the wound are unknown, although bacterial contamination of the peristomal skin probably plays an important role. Due to severe wound infection, prolonged hospital stay, medications, or outpatient wound care may be required. In addition, more time may be required before a normal life can be resumed. PC of skin has been mainly used in stoma closure.

Banerjee[6] introduced the circumferential purse-string approximation (CPA), reporting that after an ileostomy reversal, if wounds are closed by using purse-string skin closure, wound infection is less, and scars become smaller and are cosmetically superior. Following mobilization, reanastomosis and return of the intestine to the within the peritoneal cavity, the rectus was repaired with interrupted sutures. The skin defect was then opposed with a subcuticular 2-0 polypropylene suture and a pursestring drawn together, leaving a 5 mm gap. Suture was tied and removed after 8 to 10 days after. Residual hematoma or exudate was drained through the gap and Banerjee used this method with excellent cosmetics results in more than 20 patients.

Sutton CD et al reported that in his study, no SSI occurred in 51 Fifty-one patients (38 men, 13 women; average age 64 years, age range 52–81 years) who underwent a purse-string approximation.[22] After stoma closure, patient satisfaction and the cosmetic appearance of the wound scar are important. The technique produced a zero infection rate following

stomal closure in his group of patients, in that no patient developed an abscess or required antibiotic treatment for cellulitis. His series highlights the importance of such a technique in preventing wound sepsis.

McCartan DP et al conducted a meta-analysis of studies revealing SSI following stoma reversal was markedly reduced when purse-string approximation was used for wound closure with no differences noted in length of hospital stay and, in the long term, an improved self-reported cosmetic outcome.[23] In his study, MEDLINE and EMBASE were searched between January 1966 and August 2012 for all studies comparing PC and CPA. The abstracts of the American Society of Colon and Rectal Surgeons, the Association of Coloproctology of Great Britain and Ireland, the European Society of Coloproctology and the Tripartite meetings from 2000 to 2012 were screened for relevant, unpublished studies along with the Current Controlled Trials Register and the Cochrane Database of Controlled Trials. The total number of patients assigned to treatment in the 6 studies was 403, 233 in the PC and 170 in the CPA groups. On random-effects analysis, primary outcome was a marked reduction in SSI in patients who underwent CPA wound closure. In Secondary outcomes, five studies examined length of hospital stay and did not identify a significant difference between the two wound closure techniques, Three studies examined patient self-reported assessment of cosmetic outcome using a visual analogue scale from 1to 10, at a minimum of 7 months following the reversal procedure (range 7–25 months), comparing 73 patients inthe PC group to 78 patients in the CPA group. Patients who had undergone skin closure with CPA reported a higher satisfaction with cosmetic outcome at long-term follow-up.

Many surgeons were concerned to find the risk factors responsible for the surgical site infection. A famous surgeon, Akiyoshi et al[24] performed a study whose aim was to examine possible risk factors associated with complications, especially wound infections, after loop ileostomy closure with primary linear closure of skin technique in patients with rectal tumor.

His study included 125 patients for whom an ileostomy had been performed after surgery for the treatment of rectal cancer. The study showed that most complications associated with ileostomy closure in a homogeneous group of patients with rectal tumor were wound infections. Being male and having wound infection at the time of rectal cancer surgery were significant risk factors for wound infection after the ileostomy reversal. He stated that surgeons should be aware of such high-risk patients, and techniques other than primary linear closure might need to be considered in high-risk patients to reduce wound infections.

Marquez TT et al[25] conducted a study on patients undergoing stoma closure between 2002 and 2007 at a single tertiary care institution and were retrospectively assessed. He reported that significant risk factors for SSI were long operative time, increased blood loss and chronic renal failure in the PC group.[25] In this study, the SSI rate in the primary linear closure group was 18%, which is consistent with previous reports in the literature. No patient presented with SSI in the purse-string group. Within the PC group, significant risk factors for SSI in univariate analysis were long operative time, increased blood loss, and chronic renal failure. There was also a trend for higher SSI rates in patients with higher BMI and in those whose anastomosis was hand-sewn.

Camacho-Mauries et al[26] reported that a subgroup of patients who did not have an infection had a shorter healing time of 2 weeks, which is approximately half the healing time in the purse-string group.Wound infection within 30 days of surgery was defined as the presence of purulent discharge, pain, erythema, warmth, or positive culture for bacteria. Patient satisfaction, healing time, difficulty managing the wound, and limitation of activities were analyzed with the Likert questionnaire. The infection rate for the control group was 36.6% vs 0% in the pursestring closure group Healing time was 5.9 weeks in the linear closure group and 3.8 weeks in the pursestring group .Seventy percent of the patients with pursestring closure were very satisfied in comparison with 20% in the

other group. The pursestring method resulted in the absence of infection after ostomy wound closure (shorter healing time and improved patient satisfaction).

Reid et al[27] conducted a randomized prospective study on 61 patients who underwent an ileostomy reversal by dividing them into a group in which wound closure had been performed by conventional linear skin closure (n = 31) and a group in which purse-string skin closure had been performed (n = 30). In the purse-string skin closure group, wound infection was 6.7% (2 cases), which was significantly lower in comparison with the linear skin closure group (38.7%, 12 cases).

Siamak Milanchi et al[28] conducted a study reporting circumferential subcuticular wound approximation was associated with a significantly lower incidence of wound infection after ileostomy closure compared to primary closure. A trend was present toward better cosmetic results for circumferential subcuticular wound approximation than primary closure.49 consecutive patients undergoing ileostomy closure over an 18-month period were reviewed. Primary linear closure was performed in 25 patients and circumferential subcuticular wound approximation performed in 24 patients. No wound infections occurred in the circumferential subcuticular wound approximation group, compared to 40% wound infection rate observed in the primary closure group. The mean patient satisfaction score regarding wound care, cosmetic, post op pain, time of wound healing and limitation of activity was higher in the circumferential subcuticular wound approximation group (18.4) vs. the primary closure group (15.9; P 9 0.05).

Jung Ryeol Lee et al[29] conducted a study between December 2002 and October 2010, a total of 48 consecutive patients undergoing a loop ileostomy reversal were enrolled. Outcomes were compared between linear skin closure (n = 30) and purse string closure (n = 18). Wound infection was found in 5 cases (16.7%) in PC group and in one case (5.6%) in group CPA.

Mina Alvandipour et al[30] conducted a randomized clinical trial, enrolled 66 patients who underwent a stoma closure in Sari Emam Khomeini Hospital. Patients were divided into the CPA group (n = 34) and the PC group (n = 32). The incidences of infection for the 2 groups were compared, and the patients' satisfaction and pain with the stoma were determined by using a questionnaire. Infection occurred in 1 of 34 CPA patients (2.9%) and in 7 of 32 PC patients (21.8%). Patients in the CPA group were more satisfied with the resulting wound scar and its cosmetic appearance at one month and three months after surgery. After stoma closure, CPA was associated with a significantly lower incidence of wound infection and greater patient satisfaction compared to PC. However, the healing period for patients who underwent CPA was longer than it was for those who underwent PC.

Ohue M et al[31] compared the incidence of postoperative complications, including superficial incisional surgical site infection (SSI) following purse-string skin closure (26 patients) and conventional linear skin closure with a drainage tube (29 patients) following stoma closure. A total of 55 consecutive patients who underwent loop colostomy and loop ileostomy closures in our hospital between October, 2011 and September, 2014 were retrospectively assessed. Incidence of superficial incisional SSI was lower in the CPA group compared to that in the PC group (0 vs. 13.8%, respectively).

Gachabayov et al[32] conducted a systematic review and meta-analysis in which EMBASE, MEDLINE, Pubmed, Cochrane Library, Web of Science, and CINAHL databases were systematically searched. The primary endpoint of study was SSI rate. Twenty studies (6 experimental and 14 observational) totalling 1812 patients (826 CPA and 986 PC) were included. SSI rates were significantly lower statistically and clinically in patients with CPA in the meta-analysis of all studies. SSI rate was 3.1% (26/826) in CPA vs. 20.2% (199/986) in PC. The mean difference in operating time, Incisional hernia rates between PSC and LC was not statistically significant.

Yoon SL et al[33] conducted a prospective nonrandomized trial, 48 patients of two groups CPA group (n = 34) and the PC group (n = 14) who underwent a stoma closure from February 2010 to October 2013. The incidences of SSI for the two groups were compared, and the patients' satisfaction with the stoma closure was determined by using a questionnaire. After stoma closure, CPA was associated with a significantly lower incidence of wound infection (3/14[21.4%] in PC vs. 0/34 [0%] IN CPA) and greater patient satisfaction compared to PC. However, with the CPA technique, the time to heal is longer than it is with PC.

D. P. O'Leary[34] conducted a randomised, controlled trial at University Hospital Limerick. 61 patients undergoing ileostomy reversal were included. 34 patients were randomised to CPA and 27 patients to PC. The primary end point was incidence of SSI and secondary endpoints measured were quality of life and satisfaction with cosmesis. 8% patients in the PSA group developed an SSI compared to 30% in the PC group at 30 days. The mean time to SSI diagnosis was faster in the PSA group (3 vs 12.3 days). Patients who developed SSI experienced a longer mean length of stay.

Infection is one of the most frequent complications that can occur after stoma closure. The incidence of wound infection highly depends on the skin closure technique, but there is no agreement on the perfect closure method for an ileostomy wound. In an effort to balance these issues, we have used circumferential pursetring subcuticular wound approximation to decrease wound size.The purpose of this study is to analyze the difference in SSI rate between the PC group and the CPA group upon stoma closure and to discuss the differences in patient satisfaction with wound healing.

MATERIALS AND METHODS

This prospective study was conducted at Dayanand Medical College and Hospital, Ludhiana and included all patients admitted to DMCH fulfilling the inclusion criteria for elective stoma closure from 1st March 2018 to 1st March 2019 with 3 month follow-up up to 30th June.

The present study was carried out with following two groups of patients

1. Patients undergoing primary linear closure
2. Patients undergoing purse string closure

Study Design – a hospital based prospective study

INCLUSION CRITERIA -

All patients with status stoma in situ admitted to DMCH and giving consent for elective stoma closure.

EXCLUSION CRITERIA-

1. Extreme of age >70 and < 15 years.
2. Those with immunocompromised state.
3. Patients not willing to give consent for participation in this study.

METHODS OF COLLECTION

Patients coming in Department of Surgery, Dayanand Medical College and Hospital with stoma in situ were taken up for the study from 1st March 2018 to 1st March 2019. In the PC group, an elliptical skin incision was made to mobilise the stoma from abdominal wall followed by anastomosis of protruding bowel. The sheath at the stoma site was closed with an absorbable multifilament interrupted sutures. A non absorbable monofilament material was used to close the peristomal incision. No wound drainage was applied for any of the patient who undewent a PC. In the CPA group, a circular incision was made at the cutaneous junction. The bowel anastomosis and the sheath closure was same as the that in PC group. A subcuticular suture [absorbable 2/0 multifilament/ monofilament] was used to close the skin leaving a small defect of approximately 1-1.5 cm diameter in the centre.

A sterile dressing was applied using a loose packing of povidone iodine gauze. Daily dressing was done in both groups. Any wound, if infected, was opened, collection drained and cavity packed with gauze daily. Wound swab was taken and sent for culture and sensitivity test and antibiotics started according to c/s report. The time to complete healing was defined as time at which a dressing was no longer needed after stitch removal and the patient no longer needed medication for wound discomfort. In addition, a questionnaire [The Korean version of patient wound healing satisfaction scale][28] was used to quantify and compare the differences in patient reported wound healing satisfaction and cosmesis after complete wound healing. This scale is five point Likert-Type scale. A score of 1 to 5 was assigned for each factor, with higher scores indicating increased satisfaction. Factors assessed include patient satisfaction regarding appearance of the scar, level of postoperative pain, time of wound healing, difficulty of wound care and limitation of activity.

NUMBER OF CASES

This prospective study included all patients admitted to DMCH fulfilling the inclusion criteria for elective stoma closure from 1st March 2018 to 1st March 2019 and patients were followed up for a period of 3 months after discharge from hospital, weekly for 1st month and monthly the rafter.

OUTCOME

Our study evaluated the various factors influencing the wound healing after stoma closure and assessing the clinical outcome after two separate techniques of stoma closure and morbidity associated with each.

STATISTICAL ANALYSIS

Data was described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using Student t-test. For comparing categorical data, Chi square ($\chi 2$) test was performed and exact test was used when the expected frequency is less than 5. A probability value (p-

value) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

INVESTIGATIONS OR INTERVENTIONS CONDUCTED ON PATIENTS

Patients included in the study underwent hematological, biochemical and radiological investigations. Patients included in the study were informed regarding their inclusion and written informed consent was taken for all the patients included in the study.

Hematological and Biochemical Investigations –

1. Hemogram
2. Serum electrolytes
3. Serum urea and creatinine
4. Serum albumin

Radiological Investigations –

1. Chest xray
2. Ileostogram
3. Gastrograffin Enema

OBSERVATIONS AND RESULTS

A hospital based prospective study was conducted on wound healing after stoma closure to compare difference in SSI rate between the PC (primary linear closure) group and the CPA (circumferential purse-string approximation) group and to discuss the differences in patient satisfaction with wound healing. The following study was carried out with 18 patients in purse-string group and 33 patients in linear closure group.

Distribution of patients according to Age

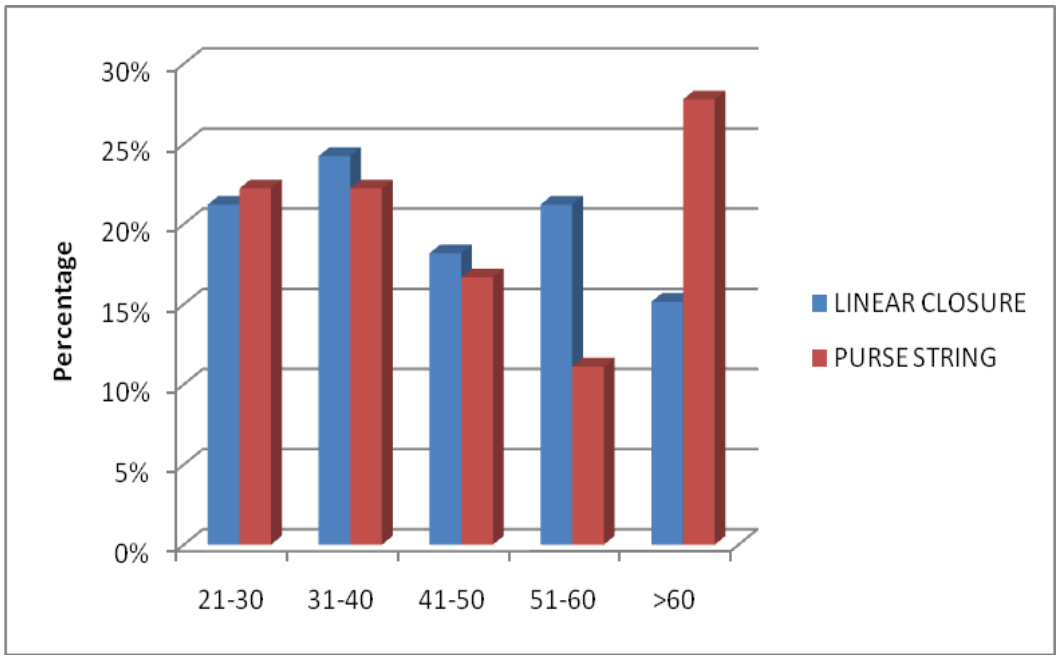
Majority of patients in linear closure group were in 31-40 years (24%), followed by 21-30 and 51-60 years (21%), followed by 41-50 years (18%), followed by >60 years (15%).

Majority of patients in pursestring closure group were in >60 years (28%), 21-30 and 31-40 years (22%) followed by 41-50 (17%) and 51-60 years (11%). There was no significant difference between the groups as per Student t-test (p>0.05).

Table 1: Distribution of patients according to Age

		Group				Total	Chi-square value	p-value
		LINEAR CLOSURE		PURSE STRING				
Age group	21-30	7	21%	4	22%	14	2.554	0.635
	31-40	8	24%	4	22%	16		
	41-50	6	18%	3	17%	12		
	51-60	7	21%	2	11%	14		
	>60	5	15%	5	28%	12		
Total		33	100%	18	100%	51		

Figure 1: Distribution of patients according to Age



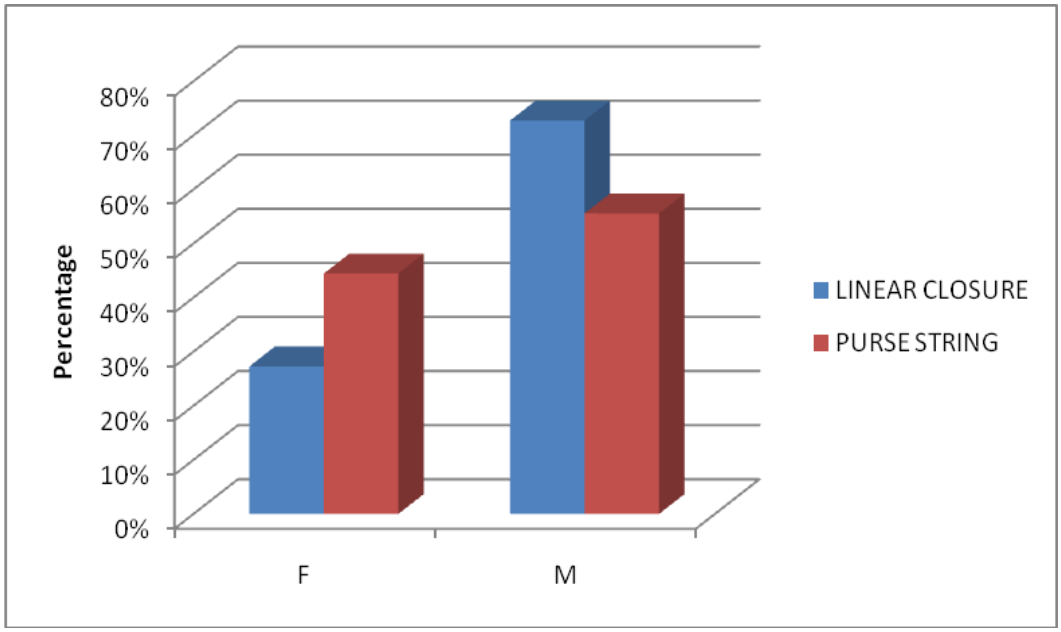
Distribution of patients according to Gender

There was male preponderance in both the groups (73% and 56% respectively) while there was 27% and 44% female patients in linear closure and purse string group respectively.

Table 2: Distribution of patients according to gender

		Group				Total
		LINEAR CLOSURE		PURSE STRING		
Gender	F	9	27%	8	44%	21
	M	24	73%	10	56%	47
Total		33	100%	18	100%	68

Figure 2: Distribution of patients according to gender



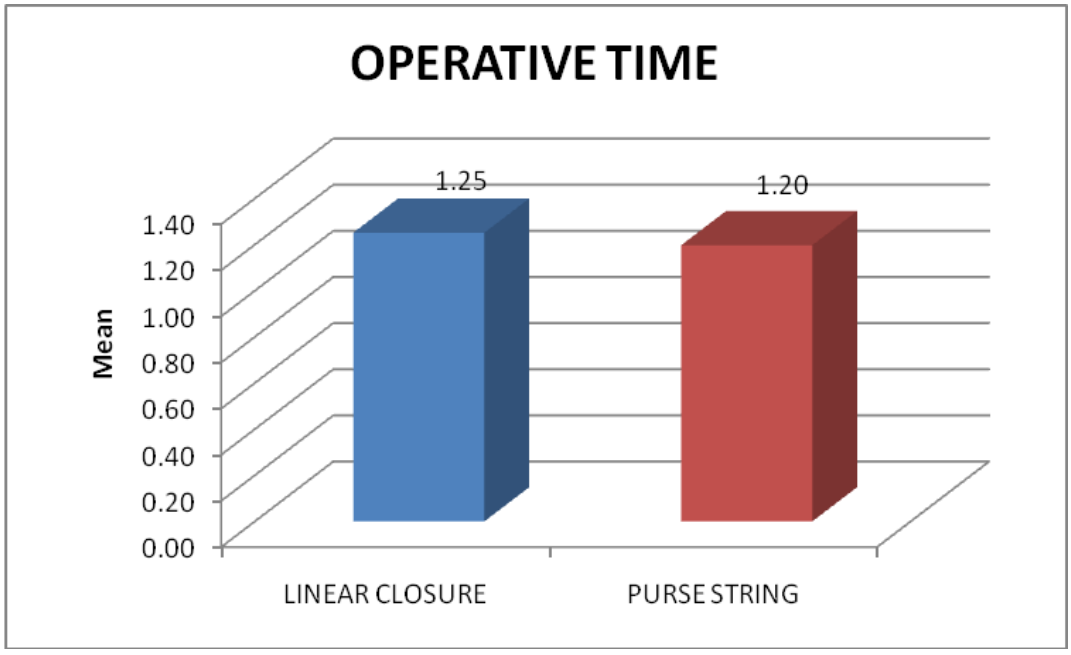
Distribution of patients according to operative time

The mean duration of operative time in linear closure group and purse string closure group was 1.25 ± 0.13 and 1.20 ± 0.07 hours respectively. There was no significant difference between the groups as per Student t-test (p>0.05).

Table 3: Distribution of patients according to operative time

	LINEAR CLOSURE		PURSE STRING		t	p-value
	Mean	SD	Mean	SD		
OPERATIVE TIME	1.25	0.13	1.20	0.07	1.446	0.153

Figure 3: Distribution of patients according to operative time



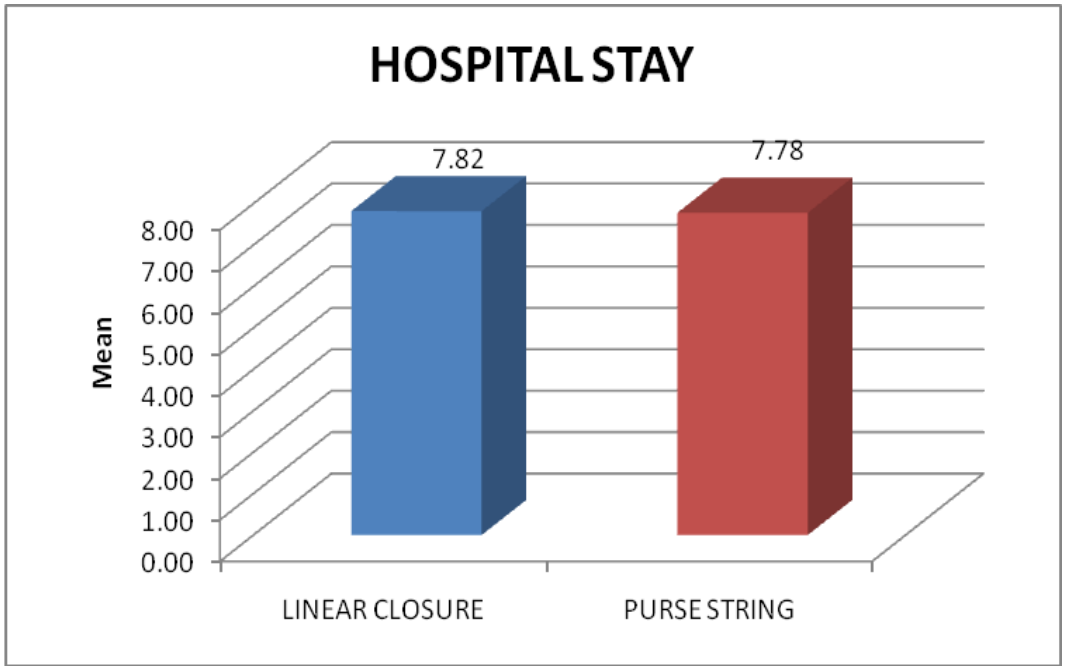
Distribution of patients according to Hospital Stay

The mean duration of Hospital Stay in linear closure group and purse string closure group was 7.82 ± 1.65 and 7.78 ± 1.48 days respectively. There was no significant difference between the groups as per Student t-test (p>0.05).

Table 4: Distribution of patients according to hospital stay

	LINEAR CLOSURE		PURSE STRING		t	p-value
	Mean	SD	Mean	SD		
HOSPITAL STAY	7.82	1.65	7.78	1.48	0.322	0.749

Figure 4: Distribution of patients according to hospital stay



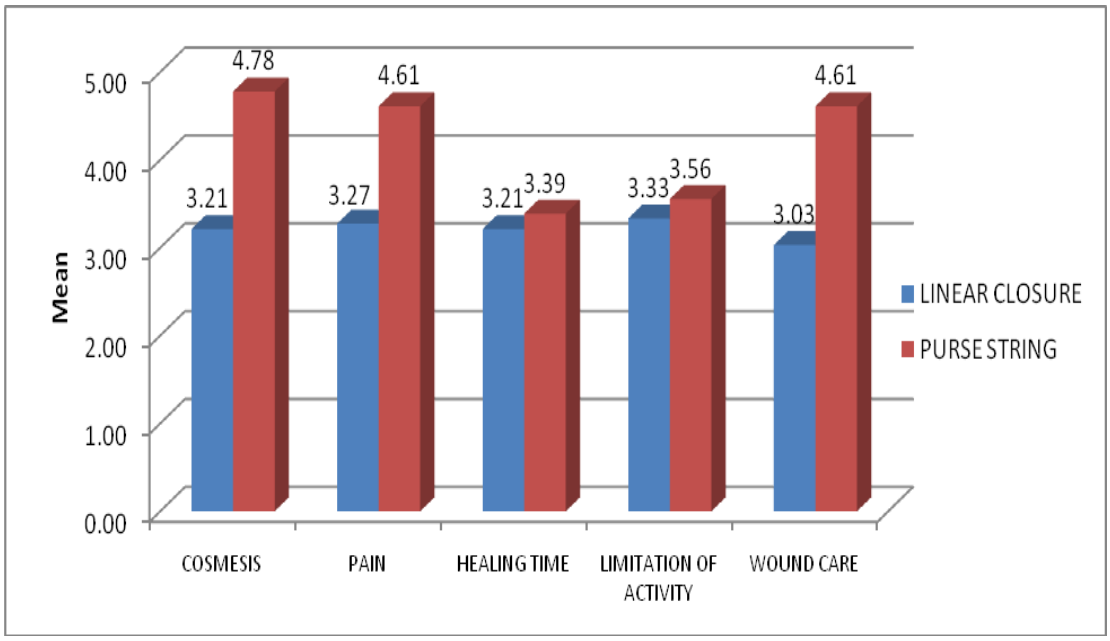
Distribution of patients satisfaction score according to cosmesis, pain, healing time, limitation of activity and wound care

The overall total satisfaction score was higher in the purse string group. The purse string closure group showed significantly higher satisfaction score for expectations regarding appearance of scar/cosmesis, level of postoperative pain and difficulty of wound care. There was significant difference between the groups as per Student t-test ($p<0.05$). There were no significant difference in patients satisfaction score for time of wound healing and limitation of activities ($p>0.05$).

Table 5: Distribution of patients according to cosmesis, level of post operative pain, time of wound healing, limitation of activity and difficulty of wound care

	LINEAR CLOSURE		PURSE STRING		t	p-value
	Mean	SD	Mean	SD		
COSMESIS	3.21	0.79	4.78	0.43	-7.534	0.000
PAIN	3.27	0.85	4.61	0.50	-6.456	0.000
HEALING TIME	3.21	0.90	3.39	0.50	-1.204	0.233
LIMITATION OF ACTIVITY	3.33	0.85	3.56	0.51	-1.483	0.143
WOUND CARE	3.03	0.70	4.61	0.50	-8.955	0.000

Figure 5: Distribution of patients according to cosmesis, level of post operative pain, time of wound healing, limitation of activity and difficulty of wound care



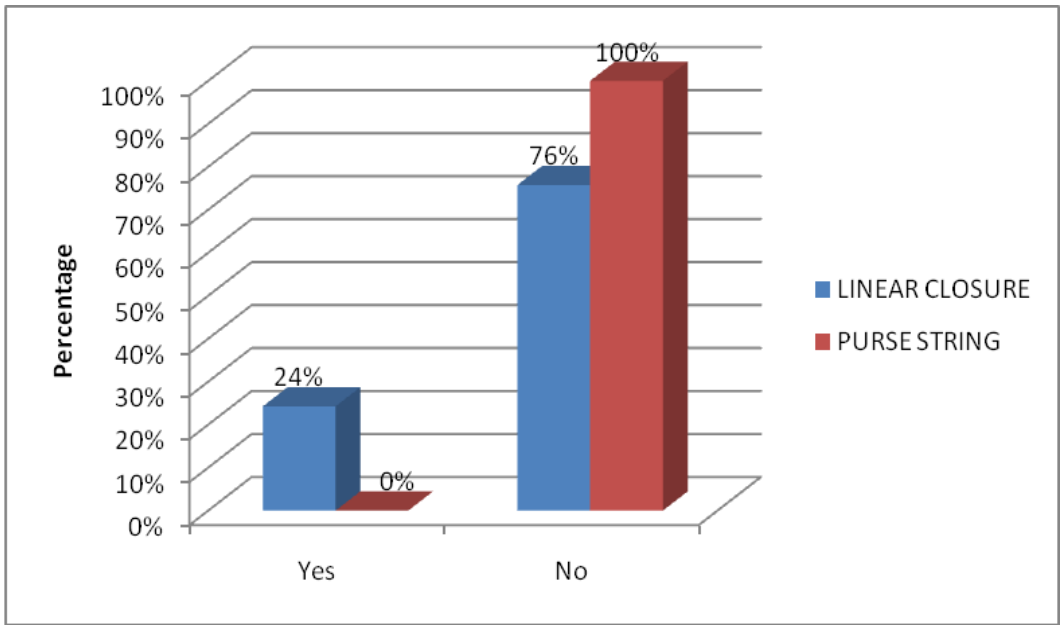
Distribution of patients according to complications (surgical site infection)

The complication rate in linear closure group and purse string closure group was 24% (8 out of 33) and 0% (0 out of 18) respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

Table 6: Distribution of patients according complications (surgical site infection)

		group				Total	Chi-square value	p-value
		LINEAR CLOSURE		PURSE STRING				
Complication	Yes	8	24%	0	0%	8	5.175	0.039
	No	25	76%	18	100%	43		
Total		33	100%	18	100%	51		

Figure 6: Distribution of patients according to complications (surgical site infection)



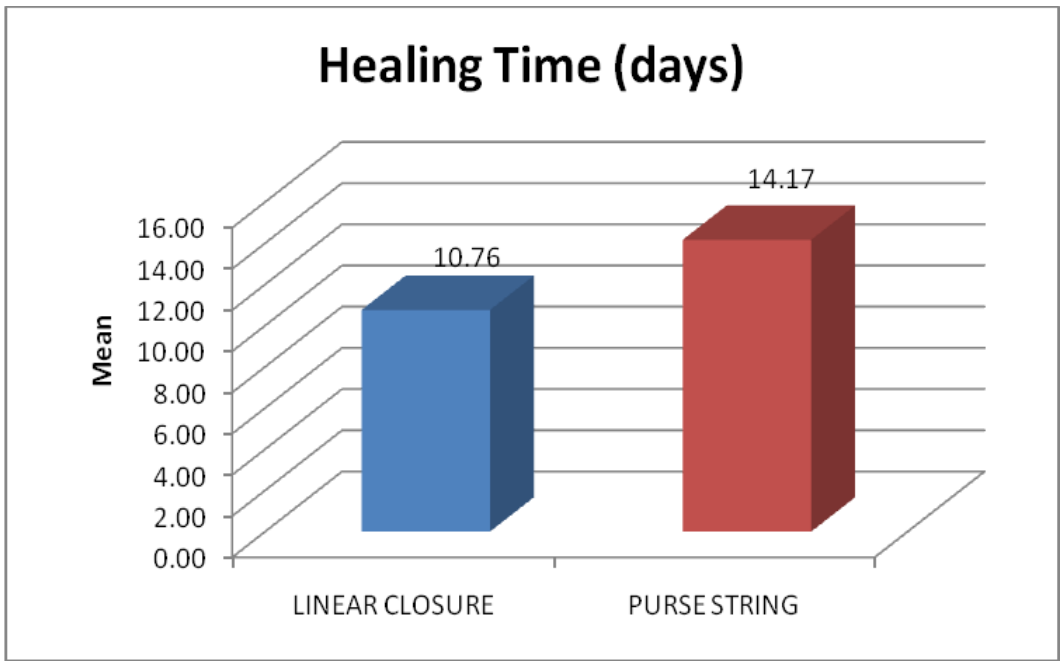
Distribution of patients according to healing time of wound in purse string group and linear group

The mean healing time of wound in linear closure group and purse string group was 10.76 ± 5.68 days and 14.17 ± 2.04 days respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

Table 7: Distribution of patients according to healing time of wound in purse string group and linear group

	LINEAR CLOSURE		PURSE STRING		t	p-value
	Mean	SD	Mean	SD		
Healing Time (days)	10.76	5.68	14.17	2.04	-2.432	0.018

Figure 7: Distribution of patients according to healing time of wound in purse string group and linear group



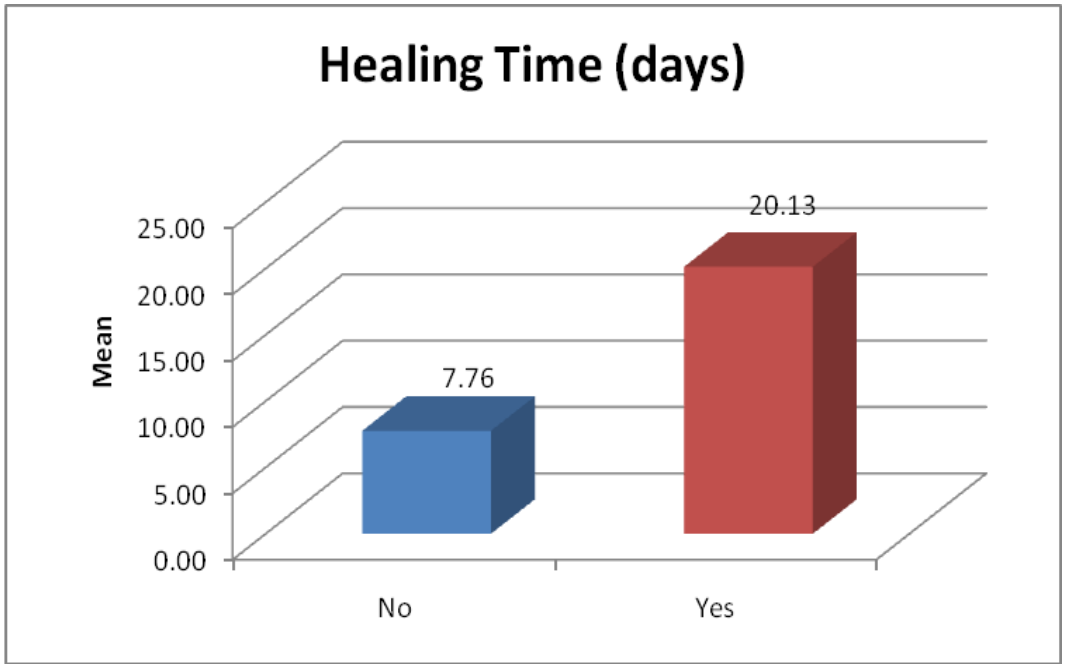
Distribution of patients according to healing time in linear group with and without complications

The mean healing time of wound in linear closure without and with complication was 7.76 ± 1.52 days and 20.13 ± 2.93 days respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

Table 8: Distribution of patients according to healing time in linear group with and without complications

LINEAR CLOSURE	No (n=39)		Yes (n=11)		t	p-value
Complications	Mean	SD	Mean	SD		
Healing Time (days)	7.76	1.52	20.13	2.93	-19.741	0.000

Figure 8: Distribution of patients according to healing time in linear group with and without complications



DISCUSSION

This hospital based prospective study was conducted at our tertiary care centre to compare and evaluate the efficiency of purse-string skin closure in a stoma reversal and conventional linear skin closure. The present study was carried out with following two groups of patients –

1. Patients undergoing Linear closure (33 patients)
2. Patients undergoing purse string closure (18 patients)

After stoma closure, SSI is the most common complication. Depending on the author and the closure technique, the SSI rate varies from 0% to 41%. Primary linear closure, secondary delayed closure, and purse-string closure have been introduced as stoma closure techniques, but there is no consensus on the ideal closure technique for a stoma wound despite continuing study.

There are many theories concerning why wound infection occurs less frequently following a CPA than following a PC. The advantage of the CPA is that, until granulation tissues grow and the skin is epithelialized, small skin defect areas become natural drainage pathways, which prevents wound infection.[29] Factors accounting for the high rate of infection after primary linear closure of the wound are unknown, although bacterial contamination of the peristomal skin probably plays an important role.[6]

In this prospective nonrandomized trial, the SSI rate was 24% (8 out of 33 patients) after primary linear closure and 0% (0 out of 18) SSI occurred in the CPA group. There was significant difference between the groups as per Student t-test ($p<0.05$).This is comparable to the studies of Sutton CD et al[22], Mina Alvandipour et al[30], Gachabayov et al[32] and Yoon SL et al.[33]

Sutton CD et al[22] reported that in his study, 0% SSI occurred in 51 Fifty-one patients (38 men, 13 women; average age 64 years, age range 52–81 years) who underwent a purse-string approximation.

Mina Alvandipour et al[30] conducted a randomized clinical trial. Infection occurred in 1 of 34 CPA patients (2.9%) and in 7 of 32 PC patients (21.8%).

Gachabayov et al[32] conducted a systematic review and meta-analysis of Twenty studies (6 experimental and 14 observational) totalling 1812 patients (826 CPA and 986 PC) were included. SSI rates were significantly lower statistically and clinically in patients with CPA in the meta-analysis of all studies. SSI rate was 3.1% (26/826) in CPA vs. 20.2% (199/986) in PC.

Yoon SL et al[33] conducted a prospective nonrandomized trial, 48 patients of two groups CPA group (n = 34) and the PC group (n = 14) who underwent a stoma closure. CPA was associated with a significantly lower incidence of wound infection (3/14[21.4%] in PC vs. 0/34 [0%] IN CPA) which is very similar to our study.

The mean duration of operative time in linear closure group and purse string closure group was 1.25 ± 0.13 and 1.20 ± 0.07 hours respectively. There was no significant difference between the groups as per Student t-test ($p>0.05$).

Marquez TT et al[25] conducted a study duration of surgery was higher in the CPA (1.41 hours) group than it was in the PC (1.17 hours) group, but the difference was not statistically significant (P = 0.19).

Camacho-Mauries et al[26] study reported duration of surgery was higher in the CPA (2.11 hours) group than it was in the PC (2.03 ± 9 hours) group, but the difference was not statistically significant (P = 0.733).

Mina Alvandipour et al[30] conducted a randomized clinical trial in which duration of surgery was higher in the PSC (1.11 ± 9 hours) group than it was in the PC (1.06 ± 9 hours) group, but the difference was not statistically significant (P = 0.416).

D. P. O'Leary[34] conducted a randomised, controlled trial and concluded that the operative time was shorter in the PC group, but this was not statistically significant (63.1 vs 71 min, p = 0.28).

In our study, there was a difference in the time to complete healing between the PC and the CPA groups. The mean healing time of wound in linear closure group and purse string group was 10.76 ± 5.68 days and 14.17 ± 2.04 days respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

The mean healing time of wound in linear closure without and with SSI was 7.76 ± 1.52 days and 20.13 ± 2.93 days respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

Ohue M et al[31] conducted a retrospective study on total of 55 consecutive patients undergoing purse-string skin closure (26 patients) and conventional linear skin closure with a drainage tube (29 patients) following stoma closure. He found time to complete healing in linear closure group (13 days, range 8-29 days) was shorter than the purse string group (14 days, range 9-50 days).

Yoon SL et al[33] conducted a prospective nonrandomized trial, time to complete healing in overall linear closure group was shorter than the purse string group (18.6 days vs 32 days, P=0.000). It was much shorter in linear closure group without ssi (14.7 days, P=0.021).

In contrast to our study, healing time was shorter in purse string group than linear closure group in Reid et al[27] study. He reported that the wound-healing period of linear skin closure was 24.6 days and that of purse-string skin closure was 20.6 days, but the difference was not statistically significant.

Camacho- Mauries et al[26] reported healing time was also different; it was 40-45 days in the linear closure group with SSI and 25-28 days in the pursestring group

($p< 0.0001$). He also found that subgroup of patients who did not have an infection in linear closure group had a shorter healing time of 2 weeks (18-22 days), which is approximately half the healing time in the purse-string group in his study.

The mean duration of Hospital Stay in linear closure group and purse string closure group was 7.82 ± 1.65 and 7.78 ± 1.48 days respectively. There was no significant difference between the groups as per Student t-test ($p>0.05$).

Marquez TT et al[25] study showed mean duration of hospital stay after surgery was higher in the CPA [6 days] group than it was in the PC group [5 days], but the difference was not statistically significant (P = 0.51).

Camacho- Mauries et al[26] study had mean hospital stays of 8.4 and 7.2 days in the CPA and the PC group, respectively, but this difference was not statistically significant (P = 0.429).

Siamak Milanchi et al[28] managed to achieve mean hospital stays of 4.2 and 3.6 days in the CPA and the PC group, respectively, but this difference was not statistically significant (P = 0.19).

Mina Alvandipour et al[30] randomized clinical trial had mean hospital stays of 6.55 ± 1.8 and 6.78 ± 1.53 days in the CPA and the PC group, respectively, but this difference was not statistically significant (P = 0.512).

D. P. O'Leary[34] study showed mean hospital stays of 8.4 ± 5.8 and 7.9 ± 6.3 days in the CPA and the PC group, respectively, but this difference was not statistically significant (P = 0.834).

The overall total satisfaction score was higher in the purse string group. The purse string closure group showed significantly higher satisfaction score for expectations regarding appearance of scar/cosmesis, level of postoperative pain and difficulty of wound care. There was significant difference between the groups as per Student t-test ($p<0.05$). There were no significant difference in patients satisfaction score for time of wound healing and limitation of activities ($p>0.05$).

Milanchi et al[28] study reported a trend toward better cosmetic results for CPA than for PC. He also reported a significantly higher mean patient satisfaction score in the circumferential subcuticular wound approximation group than in the PC group.

In Klink et al[35] study, patients who underwent a CPA found that while the initial circular scar might be unappealing, final scar formation occurred along natural skin tension lines, producing a cosmetically pleasant scar.

With the purse-string procedure, level of postoperative pain is less as until granulation tissues grow and the skin is epithelialized, small skin defect areas become natural drainage pathways, which continuously drains seroma fluid which prevents any oedema, tenderness and wound infection. Also minimal handling and no need of any poking of wound in postop dressings minimize the pain. Patients' responses and significant differences in our study indicated that the CPA was associated with less postoperative pain and discomfort.

It is, however observed that our study has some limitations also. The study was nonrandomized, and the number of patients was small. The SSI rate in the PC group was higher than it was in some other studies for reasons that are unclear. Although the SSI rate was high, considering the small case number, we think that prophylactic antibiotics might have influenced the incidence of SSI. Thus, we are considering a change of prophylactic antibiotics.

If the CPA was performed as a skin closure technique after stoma reversal, the incidence of SSI was lower than it was when a PC was used. Also, patient satisfaction for expectations regarding appearance of scar/cosmesis, level of postoperative pain and difficulty of wound care was greater in the CPA group than in the PC group. However, the CPA technique takes a longer time to heal than the PC technique. We think that CPA may be a good alternative option, but further prospective randomized trials involving more patients are necessary before a definitive conclusion can be drawn.

SUMMARY AND CONCLUSION

This prospective study was conducted in the department of General Surgery at Dayanand Medical College and Hospital, Ludhiana after approval by Institutional Ethics Committee on a total of 53 patients to assess the clinical outcome of wound healing after two separate techniques of stoma closure.

The present study was carried out with following two groups of patients

1. Patients undergoing primary linear closure
2. Patients undergoing purse string closure

The following observations were noted –

1. Majority of patients in linear closure group were in 31-40 years (24%), followed by 21-30 and 51-60 years (21%), followed by 41-50 years (18%) ,followed by >60 years (15%).
2. Majority of patients in pursestring closure group were in >60 years (28%), 21-30 and 31-40 years (22%) followed by 41-50 (17%) and 51-60 years (11%). There was no significant difference between the groups as per Student t-test ($p>0.05$).
3. There was male preponderance in both the groups (73% and 56% respectively) while there was 27% and 44% female patients in linear closure and purse string group respectively.
4. The mean duration of operative time in linear closure group and purse string closure group was 1.25 ± 0.13 and 1.20 ± 0.07 hours respectively. There was no significant difference between the groups as per Student t-test ($p>0.05$).
5. The mean duration of Hospital Stay in linear closure group and purse string closure group was 7.82 ± 1.65 and 7.78 ± 1.48 days respectively. There was no significant difference between the groups as per Student t-test ($p>0.05$).
6. The overall total satisfaction score was higher in the purse string group. The purse string closure group showed significantly higher satisfaction score for expectations regarding appearance of

scar/cosmesis, level of postoperative pain and difficulty of wound care. There was significant difference between the groups as per Student t-test ($p<0.05$). There were no significant difference in patients satisfaction score for time of wound healing and limitation of activities ($p>0.05$).

7. The complication rate in linear closure group and purse string closure group was 24% (8 out of 33) and 0% (0 out of 18) respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).
8. The mean healing time of wound in linear closure group and purse string group was 10.76 ± 5.68 days and 14.17 ± 2.04 days respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).
9. The mean healing time of wound in linear closure without and with complication was 7.76 ± 1.52 days and 20.13 ± 2.93 days respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

Hence we conclude that if CPA is performed as a skin closure technique after stoma reversal, the incidence of SSI was lower than it was when a PC was used and patient satisfaction for expectations regarding appearance of scar/cosmesis, level of postoperative pain and difficulty of wound care are greater in the CPA group than in the PC group. Thus, CPA technique can be considered as a better option in stoma closure.

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PICTURE 1: DEFECT OF 1-1.5 CM IN THE CENTRE AFTER SKIN CLOSURE

PICTURE 2: INIMAL SCAR AFTER COMPLETE HEALING

PICTURE 3: DEFECT OF 1-1.5 CM IN THE CENTRE AFTER SKIN CLOSURE

PICTURE 4: MINIMAL SCAR AFTER COMPLETE HEALING

Sr. No	Name	Age	Gender	CR No	Age group	HR	SBP	DBP	RR	TEMP	GCS	Pallor	Edema	Icterus	Cyanosis	Lymphadenopathy	HB	PCV	TLC	Na	K	Cl	Urea	Creat	Albumin	Ileostogram	Gastrograffin Enema
1	SS	57	M	232705	51-60	102	110	80	22	AFEBRILE	E4 V5 M6	-	-	-	-	-	8.1	24.4	7.8	136	3.4	102	30	12	3.8	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
2	MK	27	F	396544	21-30	102	110	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	12.4	41.1	7.8	137	4.5	102	17	0.5	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
3	SS	58	M	399095	51-60	100	110	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	10.1	42	8.1	143	3.8	101	25	0.8	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
4	P	51	M	417808	51-60	92	100	70	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	9.8	42	11.1	136	4.1	102	34	1.2	4.1	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
5	KK	36	F	362415	31-40	88	130	70	21	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.9	35	8.3	135	4	103	37	0.8	4.3	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
6	BD	72	M	46783	61-90	90	100	90	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.4	41	10.1	137	4.1	106	31	0.7	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
7	PS	24	F	454488	21-30	98	110	80	22	AFEBRILE	E4 V5 M6	+	-	-	-	-	11.6	41	10.1	136	3.6	106	47	0.8	4.1	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
8	A	43	F	489776	41-50	90	100	80	22	AFEBRILE	E4 V5 M6	-	-	-	-	-	8.2	24.4	8.7	139	3.8	112	32	0.9	3.4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
9	AK	61	M	482162	61-90	90	100	90	22	AFEBRILE	E4 V5 M6	-	-	-	-	-	10	25	8	135	4.6	102	32	1	4.7	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
10	JK	39	F	481459	31-40	94	120	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.3	37	7.9	134	3.6	103	18	1.2	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
11	AC	63	M	512242	61-90	90	100	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	8.2	24.4	7.8	136	3.5	102	30	1.2	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
12	PK	17	F	409965	21-30	92	90	80	22	AFEBRILE	E4 V5 M6	+	-	-	-	-	8.1	24.4	7.8	136	3.4	102	30	1.1	3.7	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
13	AT	63	M	297881	61-90	112	110	80	20	AFEBRILE	E4 V5 M6	+	-	-	-	-	9.1	28.4	8.8	134	3.8	108	36	1.2	3.8	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
14	MR	85	M	457329	61-90	88	110	70	28	AFEBRILE	E4 V5 M6	+	-	-	-	-	10.2	40	81	140	3.7	107	30	0.9	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
15	AS	38	M	401520	31-40	94	120	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	10.5	40	8.2	138	4	102	16	1	4.2	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
16	JR	30	M	465527	21-30	88	120	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.3	34	9	131	3.8	106	25	0.7	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
17	RK	51	F	415384	51-60	98	130	90	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.6	36	10	141	3.8	108	26	0.9	4.2	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
18	S	18	F	508001	21-30	100	110	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.4	37	9	137	3.8	104	28	0.8	4.3	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
19	SK	60	F	368883	51-60	98	120	80	22	AFEBRILE	E4 V5 M6	-	-	-	-	-	10.7	36	11	138	3.8	104	32	1.2	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
20	RR	52	F	420771	51-60	86	110	80	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	9.8	35	8	134	3.6	109	29	0.6	3.8	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
21	GS	45	M	486103	41-50	84	100	80	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	12.4	38	10	136	3.5	104	38	0.7	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
22	MK	45	F	460634	41-50	98	120	90	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	9.2	30	5.6	131	3.6	102	18	1.2	4.6	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
23	VS	32	M	486771	31-40	82	130	20	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	13	37	8	138	41	107	27	1	4.1	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
24	RS	35	M	520118	31-40	102	120	90	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	13	42	10	138	4	109	34	1.1	4.2	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
25	RC	68	M	525474	61-90	104	130	90	21	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.8	24	8	137	3.9	101	23	0.6	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
26	SS	67	M	133198	61-90	88	106	84	22	AFEBRILE	E4 V5 M6	-	-	-	-	-	9.7	3.3	11	134	3.8	104	24	1.1	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
27	K	18	F	513163	21-30	94	114	90	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.4	38	10	134	4.4	107	22	0.7	3.6	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
28	LS	45	M	525432	41-50	90	116	80	17	AFEBRILE	E4 V5 M6	-	-	-	-	-	12.3	28	8	136	4	105	25	9	4.4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
29	VS	26	M	419135	21-30	72	110	90	16	AFEBRILE	E4 V5 M6	-	-	-	-	-	12	32	8	136	3.8	105	32	1.1	3.8	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
30	K	70	M	523815	61-90	74	100	80	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.4	35	8	131	3.8	106	30	1	4.1	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
31	A	35	M	529799	31-40	85	110	70	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.8	32	8	130	3.8	101	26	1.2	3.8	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
32	J	48	M	549713	41-50	88	110	70	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	9.4	28	9	132	4.1	104	28	0.7	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
33	MS	65	M	557888	61-90	104	120	90	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	13	30	7	135	4	105	26	0.9	4.3	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
34	NA	40	F	510357	31-40	96	130	90	22	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.8	42	8	130	3.7	103	30	1	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
35	SJ	45	M	614296	41-50	100	120	80	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	10	42	8	144	4	101	25	0.8	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
36	SS	45	M	6247043	41-50	92	100	80	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	9.8	40	11	137	4	102	34	1	4.1	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
37	PS	56	M	608564	51-60	104	110	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	12	41	8	137	4.5	102	17	0.6	3.8	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
38	BD	22	F	577136	21-30	82	120	70	22	AFEBRILE	E4 V5 M6	-	-	-	-	-	12	35	8	135	4	103	35	1	4.2	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
39	K	32	M	499273	31-40	92	110	90	16	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.4	41	10	138	4	108	30	0.7	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
40	J	32	M	568402	31-40	98	120	80	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	12.4	40	10	132	3.6	106	47	0.8	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
41	HS	40	M	565298	31-40	94	120	80	19	AFEBRILE	E4 V5 M6	-	-	-	-	-	13	37	7	135	3.6	105	18	1.1	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
42	J	43	M	593998	41-50	84	110	80	17	AFEBRILE	E4 V5 M6	-	-	-	-	-	8.2	24	7	136	4	108	30	1	3.8	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
43	DS	60	M	522876	51-60	83	120	70	17	AFEBRILE	E4 V5 M6	-	-	-	-	-	8	24	7	135	3.8	108	30	1	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
44	HS	18	M	631938	21-30	82	90	80	16	AFEBRILE	E4 V5 M6	-	-	-	-	-	10	40	9	140	3.8	107	40	0.8	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
45	S	63	M	334247	61-90	90	100	80	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	12	34	9	138	4	104	18	1	3.9	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
46	G	35	M	580856	31-40	84	120	90	18	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.8	42	10	134	4.2	108	28	0.8	4.2	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
47	SD	24	M	617630	21-30	100	130	90	15	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.6	36	10	141	3.8	108	26	0.9	4.2	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
48	PK	50	F	655442	41-50	100	120	70	20	AFEBRILE	E4 V5 M6	-	-	-	-	-	12	47	9	136	4	104	28	1	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
49	NJ	37	F	559833	31-40	78	100	80	16	AFEBRILE	E4 V5 M6	-	-	-	-	-	9.8	35	8	134	4	109	29	0.6	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
50	PK	60	M	568839	51-60	74	110	80	16	AFEBRILE	E4 V5 M6	-	-	-	-	-	13	40	10	132	3.5	104	42	0.7	4	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY
51	M	27	F	242048	21-30	82	110	60	24	AFEBRILE	E4 V5 M6	-	-	-	-	-	11.4	35	9	135	3.4	105	36	1	4.2	NO ACTIVE LEAK OF CONTRAST SEEN	NORMAL STUDY

Sr. No	Name	Age	Gender	CR No	Procedure	Surgery Performed	Intra Operative Complications (If any)	Post Operative Complications (If any)	Operative Time	Hospital Stay	Healing Time (days)	Cosmesis	Pain	Healing Time	Limitation of Activity	Wound Care
1	SS	57	M	232705	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.12	8	8	3	3	3	4	4
2	MK	27	F	396544	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.28	7	7	4	3	3	3	4
3	SS	58	M	399095	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.35	7	18	4	4	4	4	3
4	P	51	M	417808	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.22	5	10	5	3	3	4	4
5	KK	36	F	362415	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.2	6	6	3	4	3	4	3
6	BD	72	M	46783	PURSE STRING	STOMA CLOSURE	NO	NO	1.35	8	15	5	5	3	4	4
7	PS	24	F	454488	PURSE STRING	STOMA CLOSURE	NO	NO	1.15	8	16	5	4	3	3	5
8	A	43	F	489776	PURSE STRING	STOMA CLOSURE	NO	NO	1.1	6	12	4	5	3	4	5
9	AK	61	M	482162	PURSE STRING	STOMA CLOSURE	NO	NO	1.25	9	12	4	5	3	3	5
10	JK	39	F	481459	PURSE STRING	STOMA CLOSURE	NO	NO	1.12	7	14	5	5	4	4	4
11	AC	63	M	512242	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.18	6	23	3	4	3	4	2
12	PK	17	F	409965	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.23	8	8	3	3	3	4	3
13	AT	63	M	297881	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.28	9	19	3	3	3	4	5
14	MR	85	M	457329	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.8	6	20	3	3	4	5	3
15	AS	38	M	401520	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.15	6	6	3	2	4	3	4
16	JR	30	M	465527	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.1	7	7	4	4	3	4	3
17	RK	51	F	415384	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.15	10	10	3	2	4	3	3
18	S	18	F	508001	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.3	7	7	4	5	4	3	3
19	SK	60	F	368883	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.08	7	7	3	4	3	4	4
20	RR	52	F	420771	PURSE STRING	STOMA CLOSURE	NO	NO	1.23	6	13	5	4	3	4	5
21	GS	45	M	486103	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.28	9	8	3	3	3	3	4
22	MK	45	F	460634	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.45	12	20	2	3	4	5	2
23	VS	32	M	486771	PURSE STRING	STOMA CLOSURE	NO	NO	1.25	6	12	5	4	4	3	5
24	RS	35	M	520118	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.15	8	8	2	3	4	3	2
25	RC	68	M	525474	PURSE STRING	STOMA CLOSURE	NO	NO	1.35	7	13	5	5	3	3	5
26	SS	67	M	133198	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.2	8	6	4	5	3	2	3
27	K	18	F	513163	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.17	8	6	2	3	2	3	3
28	LS	45	M	525432	PURSE STRING	STOMA CLOSURE	NO	NO	1.15	7	15	5	5	4	4	5
29	VS	26	M	419135	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.4	9	19	3	4	5	3	2
30	K	70	M	523815	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.24	9	19	2	3	4	5	2
31	A	35	M	529799	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.38	7	7	3	2	2	3	2
32	J	48	M	549713	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.36	9	9	3	2	4	4	3
33	MS	65	M	557888	PURSE STRING	STOMA CLOSURE	NO	NO	1.1	11	18	4	5	4	4	4
34	NA	40	F	510357	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.24	6	6	3	4	2	2	3
35	SJ	45	M	614296	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.14	9	9	4	2	2	2	4
36	SS	45	M	6247043	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.38	6	6	3	4	5	3	3
37	PS	56	M	608564	PURSE STRING	STOMA CLOSURE	NO	NO	1.2	6	12	5	4	4	4	4
38	BD	22	F	577136	PURSE STRING	STOMA CLOSURE	NO	NO	1.16	7	14	4	5	4	3	5
39	K	32	M	499273	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.1	8	8	3	2	3	2	3
40	J	32	M	568402	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.33	9	9	3	3	3	2	2
41	HS	40	M	565298	LINEAR CLOSURE	STOMA CLOSURE	NO	YES	1.13	5	23	4	3	4	3	4
42	J	43	M	593998	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.22	7	7	4	3	3	3	3
43	DS	60	M	522876	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.25	12	12	2	4	2	4	2
44	HS	18	M	631938	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.34	9	8	4	5	2	3	2
45	S	63	M	334247	PURSE STRING	STOMA CLOSURE	NO	NO	1.14	10	18	5	5	3	4	4
46	G	35	M	580856	PURSE STRING	STOMA CLOSURE	NO	NO	1.23	9	14	5	4	3	4	5
47	SD	24	M	617630	PURSE STRING	STOMA CLOSURE	NO	NO	1.26	7	12	5	4	4	3	4
48	PK	50	F	655442	PURSE STRING	STOMA CLOSURE	NO	NO	1.19	9	13	5	5	3	3	4
49	NJ	37	F	559833	PURSE STRING	STOMA CLOSURE	NO	NO	1.17	8	15	5	5	3	3	5
50	PK	60	M	568839	LINEAR CLOSURE	STOMA CLOSURE	NO	NO	1.1	9	9	4	3	2	2	3
51	M	27	F	242048	PURSE STRING	STOMA CLOSURE	NO	NO	1.15	9	17	5	4	3	4	5

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No. BFUHS/2K18p-TH/ 5798 **Date** 12/11/19

The Principal,
DMC, Ludhiana.

Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 31.08.2018 has approved the plan of thesis of Manavdeep Singh Bains, a student of your college for **MS General Surgery** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
A prospective study on wound healing after stoma closure

Supervisor	Co-Supervisor
Dr. Amandeep Singh Nar	Dr. Atul Mishra
Assoc. Prof.,	Prof.,
Dept. of Surgery,	Dept. of Surgery,
DMCH, Ludhiana.	DMCH, Ludhiana..

The student may submit the four copies of thesis, to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She may be directed to attach a photocopy of this letter with the forwarding letter while submitting thesis in the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic, if any.

S P Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

25. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*
26. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

M.S.

in

Surgery

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES
FARIDKOT

January, 2018

DR. MANAVDEEP SINGH

DEPARTMENT OF SURGERY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE
For the degree of	M.S. General Surgery
Name of the candidate	Dr. Manavdeep Singh
Supervisor	Dr. Amandeep Singh Nar, Associate Professor, Department of Surgery, DMCH, Ludhiana
Co-supervisor	Dr. Atul Mishra, Professor, Department of Surgery, Dayanand Medical College & Hospital, Ludhiana
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: Surgical site infection (SSI) is one of the most common complications that can occur after stoma closure. It is associated with increased costs for healthcare services, hospital stays, medications, and nursery care, as well as with increased morbidity and poor quality of life.

Aim of Study: To assess the clinical outcome of wound healing after two separate techniques of stoma closure..

Materials & Methods: This prospective study will include all patients admitted to DMCH fulfilling the inclusion criteria for elective stoma closure from 1st March 2018 to 1st March 2019 and patients will be followed up for period of 3 months after discharge from hospital, at weekly for 1st month and monthly therafter.

Clinical Significance: Our study will evaluate the various factors influencing the wound healing after stoma closure and assessing the clinical outcome after two separate techniques of stoma closure and morbidity associated with each.

Keywords: Wound Healing, Stoma Closure, Surgical site infection

(Signature)	(Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE"** exist in the Department of Surgery, DMC&H, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis is genuine and is collected by the candidate herself under our supervision and guidance.

Supervisor

Amandeep Singh Nar

Dr. Amandeep Singh Nar
Associate Professor
Department of Surgery
DMCH, Ludhiana

Co-Supervisor(s)

Dr. Atul Mishra
Professor
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DMCH, Ludhiana

Jaspal Singh.

Dr. Jaspal Singh
Professor & Head
Department of Surgery
DMCH, Ludhiana

Place : _____

Date : _____

APPROVAL PROFORMA
BY
RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	Dr. Manavdeep Singh
Department	Surgery
Topic of Thesis	A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE
Likely date of appearing in PG examination	MAY 2020
Date of enrollment	31st May, 2017
Name of Head of Department	Dr. Jaspal Singh
1) Supervisor **2) Co-Supervisor(s)**	Dr. Amandeep Singh Nar Dr. Aul Mishra
Signature of Members of Research Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
1. HOD Pharmacology	1. HOD Physiology
2. HOD Surgery	2. HOD Pathology
3. HOD Pathology	3. HOD Pharmacology
4. HOD Medicine	4. HOD SPM
5. Dean Academics	5. HOD Medicine
6. Vice Principal	6. HOD Surgery
	7. HOD Obst. & Gynae
	8. Legal Expert
	9. Secretary, IEC
	10. Dean Academics
	11. Vice Principal
	12. Principal

Approved (Yes) / No

Chairperson
Research Committee

Chairperson
Research Committee

Approved : (Yes) / No

Chairperson
Ethics Committee

Chairperson
Ethics Committee

BABA FARID UNIVERSITY OF HEALTH SCIENCES, FARIDKOT

PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	**Dr. Manavdeep Singh** Bains Surgical And General Hospital Phagwara Road Mukandpur District Nawanshahr ,Punjab
2	NAME OF THE INSTITUTE	Dayanand Medical College & Hospital
3	COURSE OF STUDY AND SUBJECT	SURGERY (MS)
4	DATE OF ADMISSION OF COURSE	31st May, 2017
5	TITLE OF THE TOPIC	A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

Surgical site infection (SSI) is one of the most common complications that can occur after stoma closure. Reports have described differences in the incidence of wound infection depending on the skin closure technique, but there is no consensus on the ideal closure technique for a stoma wound.

Wound infection after an ileostomy reversal is a relatively common complication. The incidence of wound infection ranges from 0% to as high as 41%, depending on investigators.[1,2]

The causes of wound infection are a contaminated wound due to bacteria on the skin in the vicinity of the ileostomy in contact with bowel contents for a long time and the leakage of the ileostomy contents.

It is associated with increased costs for healthcare services, hospital stays, medications, and nursery care, as well as with increased morbidity and poor quality of life.[3,4,5]

Therefore, to reduce wound infection, Banerjee [6] reported that after an ileostomy reversal, if wounds are closed by purse-string skin closure, wound infection is less, and scars become smaller, making it cosmetically superior.

Until now, studies analyzing the effectiveness of purse-string skin closure are rarely conducted.

In this study, in order to assess the efficacy of purse-string skin closure in an ileostomy reversal, we will perform wound closure by using either conventional linear skin closure or purse-string skin closure, and compare the rates of wound infection.

6.2 REVIEW OF LITERATURE

A temporary stoma is frequently used in the treatment of intestinal perforation, obstruction, colorectal cancer, inflammatory bowel disease and diverticulitis. In particular, it is used to reduce the anastomotic leakage and the reoperation rate. Various complications can occur after stoma closure. Wound infection,small bowel obstruction, anastomotic leakage and incisional hernia are examples of complications.

Among them, surgical site infection (SSI) is the most common complication, occurring in 2%-40% of cases after primary linear closure (PC).[7,8] Factors accounting for the high rate of infection after primary linear closure of the wound are unknown, although bacterial contamination of the peristomal skin probably plays an important role. Due to severe wound infection, prolonged hospital stay, medications, or outpatient wound care may be required. In addition, more time may be required before a normal life can be resumed. PC of skin has been mainly used in stoma closure.

Banerjee [9] introduced the circumferential purse-string approximation (CPA), reporting that after an ileostomy reversal, if wounds are closed by using purse-string skin closure, wound infection is less, and scars become smaller and are cosmetically superior.

Sutton CD et al reported that no SSI occurred in 51 patients who underwent a purse-string approximation.[10] After stoma closure, patient satisfaction and the cosmetic appearance of the wound scar are important and studies evaluating these issues are underway.

McCartan DP et al conducted a meta-analysis of studies of cosmesis as a long-term outcome reported no significant difference between the PC and the CPA groups.[11] .

Mileski et al [12] reported that in 93 patients who received an ileostomy and colostomy reversal, hypertension and smoking were risk factors for wound infection.

Akiyoshi et al [13] reported that in 125 patients for whom an ileostomy had been performed after surgery for the treatment of rectal cancer, being male and having wound infection at the time of rectal cancer surgery were significant risk factors for wound infection after the ileostomy reversal.

Marquez TT et al reported that significant risk factors for SSI were long operative time, increased blood loss and chronic renal failure in the PC group.[14]

Williams et al [15] expressed concern about a longer wound-healing period and the increased medical cost in cases involving purse-string suture as discharge was drained continuously through the skin.

Camacho-Mauries et al [16] reported that a subgroup of patients who did not have an infection had a shorter healing time of 2 weeks, which is approximately half the healing time in the purse-string group.

iran conve) Reid et al [17] reported that a randomized prospective study was conducted on 61 patients who underwent an ileostomy reversal by dividing them into a group in which wound closure had been performed by conventional linear skin closure (n = 31) and a group in which purse-string skin closure had been performed (n = 30). In the purse-string skin closure

group, wound infection was 6.7% (2 cases), which was significantly lower in comparison with the linear skin closure group (38.7%, 12 cases).

The purpose of this study is to analyze the difference in SSI rate between the PC group and the CPA group upon stoma closure and to discuss the differences in patient satisfaction with wound healing.

6.3 AIMS AND OBJECTIVES OF THE STUDY

To assess the clinical outcome of wound healing after two separate techniques of stoma closure.

7. MATERIALS AND METHODS

This prospective study will be conducted at Dayanand Medical College and Hospital, Ludhiana and include all patients admitted to DMCH fulfilling the inclusion criteria for elective stoma closure from 1st March 2018 to 1st March 2019 with 3 month followup upto 30th June.

7.1 Source of Data

Patients coming in Department of Surgery of Dayanand Medical College and Hospital with stoma in situ.

7.2 METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA

All patients with status stoma in situ admitted to DMCH and giving consent for elective stoma closure.

EXCLUSION CRITERIA-

Extreme of age >70 and < 15.

Those with immunocompromised state.

Patients not willing to give consent for participation in this study.

METHODS OF COLLECTION

Patients coming in Department of Surgery of Dayanand Medical College and Hospital with stoma in situ will be taken up for the study. In the PC group, an elliptical skin incision will be given to mobilise the stoma from abdominal wall followed by anastomosis of protruding bowel. The fascia at the stoma site will be closed with an absorbable multifilament interrupted sutures. A non absorbable monofilament material will be used to close the peristomal incision. No wound drainage will be applied for any of the patient who undergo a PC. In the CPA group, a circular incision will be made at the cutaneous

junction. The bowel anastomosis and the fascial closure will be same as the that in PC group. A subcuticular suture [absorbable 2/0 multifilament/monofilament] will be used to close the skin leaving a small defect of approximately 1-1.5 cm diameter in the centre. A sterile dressing will be applied using a loose packing of povidone iodine gauze. Daily dressing will be done in both groups. Any wound if infected, will be opened, collection drained and cavity packed with gauze daily. Wound swab taken will be sent for culture and senstivity test and antibiotics will be started according to c/s report. The time to complete healing will be defined as time at which a dressing will no longer will be needed after stitch removal and the patient no longer needed medication for wound discomfort. Factors like demographic data, premedical history, stoma type and operation time will also be determined to examine. In addition, a questionnare [The Korean version of patient wound healing satisfaction scale] [18] will be used to quantify and compare the differences in patient reported wound healing satisfaction and cosmesis after complete wound healing. This scale is five point Likert-Type scale. A score of 1 to 5 will be assigned for each factor, with higher scores indicating increased satisfaction. Factors assessed will include patient satisfaction regarding appearance of the scar, level of postoperative pain, time of wound healing, difficulty of wound care and limitation of activity. Patient's follow up will be conducted every week until wound heals.

NUMBER OF CASES

This prospective study will include all patients admitted to DMCH fulfilling the inclusion criteria for elective stoma closure from 1st March 2018 to 1st March

2019 and patients will be followed up for period of 3 months after discharge from hospital, at weekly for 1st month and monthly therafter

OUTCOME

Our study will evaluate the various factors influencing the wound healing after stoma closure and assessing the clinical outcome after two separate techniques of stoma closure and morbidity associated with each.

STATISTICAL ANALYSIS

Data will be described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups will be done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test will be used when the expected frequency is less than 5. A probability value (p value) less than 0.05 will be considered statistically significant. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

Yes, patients presenting included in the study will have to undergo hematological, biochemical, radiological investigations. For this patients included in the study will be informed regarding their inclusion and written informed consent will be taken for all the patients included in the study. These

are however, essential from the patient management and are a part of the routine protocol for the management for stoma closure.

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Attached herewith

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PROFORMA

Sr. No. ___

NAME AGE/SEX

CR NO ADDRESS

OCCUPATION MOBILE

CHIEF COMPLAINTS

HISTORY OF PRESENT ILLNESS

PAST HISTORY

GENERAL EXAMINATION

VITALS (ON ADMISSION)

HR	BP	RR	TEMP
GCS	Pallor	Edema	Icterus
Cyanosis	Lymphadenopathy		

SYSTEMIC EXAMINATION

ABDOMEN

INSPECTION

PALPATION

PERCUSSION

AUSCULTATION

Signature of Candidate Signature of Supervisor

RESPIRATORY

CVS

CNS

PROVISIONAL DIAGNOSIS

INVESTIGATIONS

Date					
Hb/PCV/TLC					
Na /K/Cl					
UREA/CREAT					
Albumin					

CHEST X RAY

Ileostogram

Gastrograffin Enema

MANAGEMENT:

1. SURGERY PERFORMED

2. INTRAOPERATIVE COMPLICATION (IF ANY)

3. POST OPERATIVE COMPLICATIONS (IF ANY)

4. OPERATIVE TIME

HOSPITAL STAY

ICU

WARD

OUTCOME

Signature of Candidate

Signature of Supervisor

5 POINT LIKERT TYPE SCALE

1. COSMESIS -

1----------2----------3----------4----------5

2. PAIN -

1----------2----------3----------4----------5

3. HEALING TIME -

1----------2----------3----------4----------5

4. LIMITATION OF ACTIVITY -

1----------2----------3----------4----------5

5. WOUND CARE -

1----------2----------3----------4----------5

Signature of Candidate

Signature of Supervisor

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o.....

.....am willing to participate in the study **"A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE"** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

.....
Signature of the Witness

Name:

.....
Signature of the patient

Signature of Candidate

Signature of Supervisor

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य **"A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"A PROSPECTIVE STUDY ON WOUND HEALING AFTER STOMA CLOSURE" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ